EVOLVING MARKET EFFICIENCY IN ISTANBUL STOCK EXCHANGE

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Abstract

The main purpose of this study is testing weak-form market efficiency hypothesis in ISE using the broadest sample and time series coverage that have been ever used. We use stock prices data of all companies that constitute ISE-100 index with time series covering 1990-2002 years. We test not only whether ISE is efficient in the weak-form sense, but also whether and how it is becoming more efficient. For this purpose, we use generalized auto-regressive conditional heteroscedastic (GARCH) model.

Our research findings show that the stock returns of the individual stocks that constitute 65% of the sample space do not show random walk behavior. However, remaining part of the individual stocks exhibit significant random walk behavior. The findings for the ISE-100 national index provide support to the evolving market efficiency hypothesis. While ISE-100 index do not follow random walk for the initial period of the analysis, it gains random-walk behavior in the second period. The discriminant analysis between stocks whose returns do not follow random walk behavior and those whose returns follow random walk behavior do not significantly discriminate them.

JEL CLASSIFICATION: G14

I. INTRODUCTION

This study attempts to test the weak-form efficiency hypothesis in

Istanbul Stock Exchange by analyzing the benchmark ISE-100 index along with individual securities that constitute this index and tries to identify factors that discriminate individual stocks whose returns follow random walks from individual stocks whose returns do not follow random walk. There is evidence that Istanbul Stock Exchange lacks even weak-form efficiency (Muradoğlu and Ünal, 1994; Balaban and Kunter, 1997; Okay, 1998). The main difference of this study from previous studies lies in its research method (GARCH-M together with ARIMA to consider changing variance structure of stock returns), its broadest cross-sectional coverage (it tests ISE-100 index along with all stocks constituting ISE-100 index), its widest time period coverage (1986-2001 period), and its attempt to capture evolution process of the informational efficiency of Istanbul Stock Exchange.

The remainder of the paper is organized as follows. In section II, we test the random walk hypothesis. Section III analyzes whether stocks whose returns follow random-walk can be discriminated from the stocks whose returns do not follow random walk in terms of several stock-related factors. Section IV gives a brief conclusion.

II. THE TEST OF RANDOM WALK HYPOTHESIS

A. Research Model

Three types of the efficiency in financial markets are described in the financial literature.

- *Operational efficiency* requires that transactions are carried out cheaply. Operational efficiency assumption becomes satisfied when financial intermediaries are competitive enough.

- *Allocational efficiency* assumes that the prices of securities are adjusted according to their risks, i.e. securities with the same level of risk will offer the same expected return.

- *Informational efficiency* requires that the prices fully reflect all the information available and relevant to security valuation.

There are close links between the types of these efficiency measures. It is expected that financial markets with higher informational efficiency are more likely to retain higher operational and allocational efficiencies.

Informational efficiency is of the major concern in all financial markets. Informational efficiency means that the market is aware of all available information and uses it correctly (Fama, 1976). More formally, the capital market is efficient if

$$\phi_{t-1}^{m} = \phi_{t-1}$$

which means that the information market uses to determine security prices at t-1 (that is ϕ_{t-1}^{m}), includes all information available (that is ϕ_{t-1}^{m}), and

$$f_m\left(p_{1t}, \ldots, p_{nt} \middle| \phi_{t-1}^{m}\right) = f\left(p_{1t}, \ldots, p_{nt} \middle| \phi_{t-1}\right)$$

which means that the market understands the implications of the available information for the joint distribution of returns.

Financial literature has defined three levels of informational efficiency for capital markets.

- *Weak Form Efficiency:* Security prices fully reflect the information contained in past price movements. It is not possible to trade profitably purely on the basis of historical price information.

- *Semistrong Form Efficiency:* Security prices fully reflect all publicly available information. It is not possible to trade profitably on the basis of information from publicly available sources.

- *Strong Form Efficiency:* The prices fully reflect all relevant information whether it is publicly available or not. It is not possible to trade profitably on the basis of inside knowledge or any other sources of the information.

It should be noted that strong form efficient markets are efficient in semistrong form, and the market which is semistrong form efficient is efficient is weak form efficient but not vice versa. Weak form efficiency hypothesis implies that no profit opportunities exist on the past movement in asset prices. That is prices follow random walk.

$$r_t = \beta_0 + \sum_{i=1}^{p} \beta_i r_{t-i} + e_i \tag{1}$$

Weak-form efficiency implies that

$$\beta_i = 0, \quad i > 0 \tag{2}$$

However, since changing variance structure may result in spurious serial correlation property and market efficiency may be falsely rejected, the changing variance structure should be considered in this autocorrelation analysis. In this paper, we are using GARCH-M *(Generalized Autoregressive Conditional Heteroscedasticity in Mean)* model which takes changing variance structure in stock returns into consideration.

We are integrating GARCH-M model with AR models as shown in (3).

$$r_t = \beta_0 + \beta_1 r_{t-1} + \beta_2 r_{t-2} + \delta h_t + e_t \qquad e_t \sim (0, h_t)$$

$$h_t = \alpha_0 + \alpha_1 h_{t-1} + \alpha_2 e_{t-1} \tag{3}$$

For the individual stocks which we find significant heteroscedasticity, that is significant ARCH and GARCH terms, we use AR(2) integrated standard GARCH-M model. However, for the individual stocks where there isn't any evidence for significant changing variance structure, we use AR (4) models as shown in (4).

$$r_t = \beta_0 + \beta_1 r_{t-1} + \beta_2 r_{t-2} + \beta_3 r_{t-3} + \beta_1 r_{t-4} + e_t \qquad e_t \sim (0, h_t) \tag{4}$$

Moreover, in this analysis we try to capture the evolution process of the weak-form market efficiency in Istanbul Stock Exchange. Infant markets may initially lack weak-form efficiency; however, gradually they are becoming more efficient. In order to test this hypothesis, analysis period were divided into two equal sub-periods which were analyzed independently.

B. Sample and Data

Our sample space consists of stocks included in ISE-100 index. Because of data requirement of AR and GARCH-M models, we exclude cases with a number of monthly observations less than 50 from our analysis. This requirement has reduced total number of cases to 71. We are analyzing monthly data for the individual stocks. Our data for individual stocks cover monthly return series data over period of 1986-2001.

In addition to the individual stock analyses, we also analyze weekly return series of ISE-100 index which cover 13/06/1991 – 29/11/2001 time period. There are 523 weekly return series observations for ISE-100 index. In order to test evolving market efficiency hypothesis, we divide total 523 weeks that cover time period of 13/06/1991 – 29/11/2001 into two equal parts.

C. Empirical Results

In this section we present and discuss our empirical results for the ISE-100 index and individual stocks. We first present and discuss our empirical results (in Table 1 for the ISE-100 index. Then we present and discuss (in Table 2 and appendixes) our results for individual stocks that constitutes ISE-100 index.

C.1. ISE-100 Index

We begin the modeling of the ISE-100 index data by estimating AR(2) standard GARCH-M (1,1) model. The GARCH term is significant which shows changing variance structure in the data. ISE-100 index exhibits significant autoregressive structure in the full period. This significant autoregression is also found for the first period analysis. However, for the second period ISE-100 index returns follow random-walk, since the return series do not have a significant autoregressive term. This conclusion provides support for the evolving market efficiency hypothesis in Istanbul Stock Exchange.

Estimated AR(1) and MA(1) standard GARCH-M (1,1) models do not produce conflicting results with AR(2) standard GARCH-M (1,1) model. Here again, ISE-100 index retains significant changing variance structure and significant autoregressive structure for the full and first periods. The ISE-100 index does not show significant autoregressive structure for the second period.

C.2. Individual Stocks

The results of econometric tests for individual stocks are provided in Table 3 and 4, whereas the summary of the results are reported in Table 2. There was evidence of significance of the GARCH in 38 cases (54%), whereas the GARCH terms were not significant in remaining 33 cases (46%). Total 46 stocks (65%) exhibit a significant autoregressive term, whereas we didn't find significant autoregressive term in remaining 25 stocks (35%). These results suggest that the evidence for or against random-walk hypothesis is not black and white in the case of ISE. The informational efficiency level varies in the case of different stocks in ISE.

Table 1: The Random-Walk Hypothesis Tests of ISE-100 Returns.

Panel A: AR(2) Standard GARCH-M (1,1) Model

Full Period	$r_t = 0.014 + 0.095\, r_{t-1} + 0.033\, r_{t-2} - 0.039 h_t \quad h_t = 0.000 + 0.725\, h_{t-1} + 0.187 e_{t-1}$
N=523	(0.99) (2.06)** (0.75) (-0.19) (2.69)*** (13.77)*** (5.33)***
First Period	$r_t = 0.012 + 0.191\, r_{t-1} + 0.012 r_{t-2} - 0.005 h_t \quad h_t = 0.000 + 0.62\, h_{t-1} + 0.23 e_{t-1}$
N=261	(0.67) (2.68)*** (0.2) (-0.01) (1.6) (4.48)*** (3.01)***
Second Period	$r_t = 0.008 + 0.003\, r_{t-1} + 0.07 r_{t-2} + 0.043 h_t \quad h_t = 0.001 + 0.666\, h_{t-1} + 0.147 e_{t-1}$
N=262	(0.24) (0.05) (1.00) (0.1) (1.59) (4.35)*** (2.53)**

Panel B: AR(1) Standard GARCH-M (1,1) Model

Full Period	$r_t = 0.100\, r_{t-1} + 0.153 h_t \quad h_t = 0.000 + 0.716\, h_{t-1} + 0.188 e_{t-1}$
N=523	(2.19)** (3.23)*** (2.67)*** (12.82)*** (5.25)***
First Period	$r_t = 0.184\, r_{t-1} + 0.178 h_t \quad h_t = 0.000 + 0.62\, h_{t-1} + 0.23 e_{t-1}$
N=261	(2.68)*** (2.17)** (1.68)* (4.9)*** (3.18)***
Second Period	$r_t = 0.009\, r_{t-1} + 0.144 h_t \quad h_t = 0.001 + 0.65\, h_{t-1} + 0.16 e_{t-1}$
N=262	(0.13) (2.32)** (1.61) (4.16)*** (2.68)**

Panel C: MA(1) Standard GARCH-M (1,1) Model

Full Period	$r_t = 0.092\, e_{t-1} + 0.154 h_t \quad h_t = 0.000 + 0.715\, h_{t-1} + 0.189 e_{t-1}$
N=523	(1.95)* (3.31)*** (2.67) (12.79)*** (5.27)***
First Period	$r_t = 0.169\, e_{t-1} + 0.178 h_t \quad h_t = 0.000 + 0.62\, h_{t-1} + 0.23 e_{t-1}$
N=261	(2.48)** (2.29)** (1.69)* (4.75)*** (3.15)***
Second Period	$r_t = 0.007\, e_{t-1} + 0.141 h_t \quad h_t = 0.001 + 0.65\, h_{t-1} + 0.16 e_{t-1}$
N=262	(0.11) (2.28)** (1.62) (4.28)*** (2.72)***

Table 1: Summary of AR(4) and GARCH-M (1,1) Analyses

	Presence of GARCH Effect		*Total:*
Autocorrelation	*No GARCH Effect*	*GARCH Effect*	
Insignificant (Random Walk)	13 (18%)	12 (17%)	**25 (35%)**
Significant Autocorrelation	20 (28%)	26 (37%)	**46 (65%)**
Total:	**33 (46%)**	**38 (54%)**	**71 (100%)**

III. THE DETERMINANTS OF RANDOM-WALK BEHAVIOR OF STOCK RETURNS

A. Research Model

In this section, we are going to design discriminant analysis to determine which types of the stocks are inclined to show random-walk behavior. The discriminating variables defined in this analysis are as follows:

1. *The relative size of the market capitalization of individual stocks (MC):* This variable is computed as the average weight of constituent companies in the ISE National-100 index.
2. *The relative size of the liquidity of individual stocks (LIQ):* This variable is computed as the ratio of the liquidity of individual stocks to the total liquidity of the Istanbul Stock Exchange.
3. *Value turnover ratio (VT):* This variable is computed as the ratio of traded value to daily average market capitalization which is calculated according to stock kept in custody at Takasbank.
4. *The price to book ratio of individual stocks (MVBV).*

All of the variable values are calculated using data on December 2001. The dependent variable in the discriminant analysis is defined as the random-walk behavior of stock returns. The dependent variable gets the value of 0 if stock returns show non-random walk behavior and 1 if stock returns show random walk behavior.

B. Research Findings

The research findings in Table 5 reports group means and the results of the tests for the equality of group means. Research results indicate that stocks whose returns do not follow random walk behavior do not significantly discriminate from stocks whose returns follow random walk behavior in terms of liquidity, market capitalization, value turnover ratio, and price to book ratios. The Wilk's lambda statistics is not significant at conventional levels.

Table 4: Results of the Discriminant Analysis

	N	*MC*	*LIQ*	*VT*	*MVBV*
Non-Random Walk	17	1.95	1.46	10.50	5.22
Random Walk	42	1.00	1.09	10.62	4.92
Total :	59	1.27	1.20	.10.59	5.01
Wilk's Lambda		*0.97*	*0.99*	*1.00*	*1.00*
(F-statistics are on parentheses)		*(2.05)*	*(0.47)*	*(0.01)*	*(0.01)*

IV. CONCLUSION

This paper provides empirical analysis of the weak-form market efficiency hypothesis in Istanbul Stock Exchange. For this purpose, we have analyzed the ISE-100 index and individual stocks that constitute ISE-100 index.

The research findings show that the stock returns of the individual stocks that constitute 65% of the sample space do not show random walk behavior. However, remaining part of the individual stocks exhibit significant random walk behavior. The findings for the ISE-100 national index provide support to the evolving market efficiency hypothesis. While ISE-100 index do not follow random walk for the initial period of the analysis, it gains random-walk behavior in the second period. The discrimination analysis between stocks whose returns do not follow random walk behavior and those whose returns follow random walk behavior do not significantly discriminate them.

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Appendix 1: Estimated GARCH-M(1,1) Models	
ISE-100	$r_t = 0.012 + 0.095\ r_{t-1} + 0.032\ r_{t-2} - 0.303h_t$ $h_t = 0.000 + 0.724\ h_{t-1} + 0.187\ e_{t-1}$ (2.06)*** (2.06)*** (0.74) (-0.27) (2.69)*** (13.79)*** (5.337)***
ADANA N=119	$r_t = 13.193 + 0.125\ r_{t-1} - 0.118\ r_{t-2} - 0.01\ h_t$ $h_t = 311.126 + 0.466\ h_{t-1} - 0.076e_{t-1}$ (0.62) (0.88) (-0.87) (-0.26) (0.76) (0.61) (-3.57)***
AKBNK N=124	$r_t = -22.2 + 0.009\ r_{t-1} + 0.063\ r_{t-2} + 1.407\ h_t$ $h_t = 224.028 + 0.531\ h_{t-1} - 0.058e_{t-1}$ (-0.63) (0.07) (0.75) (0.82) (0.94) (1.05) (-0.82)
AKCNS N=51	$r_t = 0.799 + 0.189\ r_{t-1} + 0.139\ r_{t-2} + 0.025\ h_t$ $h_t = 250.888 + 0.416\ h_{t-1} - 0.128e_{t-1}$ (0.03) (1.12) (1.01) (0.45) (1.58) (1.02) (-2.18)**
AKGRT N=73	$r_t = -6.178 + 0.091\ r_{t-1} + 0.013\ r_{t-2} + 0.656\ h_t$ $h_t = 396.807 + 0.562\ h_{t-1} - 0.134e_{t-1}$ (-0.23) (0.68) (0.08) (0.64) (2.04)** (2.07)** (-3.73)***
AKSA N=131	$r_t = -44.402 + 0.167\ r_{t-1} + 0.033\ r_{t-2} + 2.157\ h$ $h_t = 224.028 + 0.531\ h_{t-1} - 0.058e_{t-1}$ (-0.69) (1.46) (0.30) (0.81) (0.94) (1.05) (-0.82)
ALCTL N=152	$r_t = 16.926 + 0.027\ r_{t-1} + 0.007\ r_{t-2} - 0.261\ h_t$ $h_t = 805.990 - 0.29\ h_{t-1} + 0.25e_{t-1}$ (1.07) (0.21) (0.08) (-0.45) (3.18)*** (-1.14) (1.84)*
ALGYO N=48	$r_t = 4.7 + 0.061\ r_{t-1} - 0.15\ r_{t-2} - 0.027\ h_t$ $h_t = 419.625 - 0.381\ h_{t-1} + 0.394e_{t-1}$ (0.27)(0.25) (-0.75) (-0.03) (1.66)* (-0.80) (1.3)
ALNTF N=66	$r_t = -46.293 + 0.229\ r_{t-1} - 0.24\ r_{t-2} + 1.838\ h_t$ $h_t = 685.084 + 0.092\ h_{t-1} + 0.191e_{t-1}$ (-0.54) (1.2) (-1.05) (0.62) (1.59) (0.2) (0.71)
ANACM N=178	$r_t = 16.321 + 0.125\ r_{t-1} + 0.051\ r_{t-2} - 0.011\ h_t$ $h_t = 744.304 + 0.021\ h_{t-1} - 0.059e_{t-1}$ (1.19) (1.25) (0.74) (-0.59) (1.66)* (0.03) (-1.86)*
ANSGR N=87	$r_t = -15.001 + 0.292\ r_{t-1} - 0.19\ r_{t-2} + 1.045\ h_t$ $h_t = 511.269 - 0.294\ h_{t-1} + 0.359e_{t-1}$ (-2.09)** (2.34)** (-1.85)** (2.83)* (3.75)*** (-1.36) (3.77)***
ATEKS N=56	$r_t = -15.001 + 0.292\ r_{t-1} - 0.19\ r_{t-2} + 1.045\ h_t$ $h_t = 511.269 - 0.294\ h_{t-1} + 0.359e_{t-1}$ (-2.09)** (2.34)** (-1.85)** (2.83)*** (3.75)*** (-1.36) (3.77)***
AYGAZ N=132	$r_t = 450.248 + 0.127\ r_{t-1} - 0.145\ r_{t-2} - 16.71\ h_t$ $h_t = 1092.084 - 0.572\ h_{t-1} + 0.005e_{t-1}$ (0.81) (1.15) (-1.06) (-0.80) (2.20)** (-0.84) (0.53)
BANVT N=98	$r_t = -5.439 + 0.008\ r_{t-1} - 0.112\ r_{t-2} + 0.015\ h_t$ $h_t = 526.754 + 0.554\ h_{t-1} - 0.059e_{t-1}$ (-0.12) (0.04) (-0.53) (0.38) (0.57) (0.67) (-0.86)
BEKO N=99	$r_t = -8.961 - 0.014\ r_{t-1} - 0.095\ r_{t-2} + 0.652\ h_t$ $h_t = 446.443 - 0.26\ h_{t-1} + 0.31e_{t-1}$ (-0.66) (-0.09) (-1.17) (0.98) (3.13)*** (-1.32) (2.01)**

Appendix 1: Estimated GARCH-M(1,1) Models

BOLUC N=178	$r_t = 20.285 + 0.090\, r_{t-1} + 0.030\, r_{t-2} - 0.515\, h_t$ (1.17) (0.82) (0.34) (-0.74)	$h_t = 127.127 + 0.69\, h_{t-1} + 0.123 e_{t-1}$ (1.01) (2.70)*** (1.43)
BRSAN N=48	$r_t = -3.553 + 0.155\, r_{t-1} + 0.049\, r_{t-2} + 0.660\, h_t$ (-0.36) (1.01) (0.36) (1.70)*	$h_t = 310.987 - 0.17\, h_{t-1} + 0.93 e_{t-1}$ (2.54)*** (-1.81)* (2.19)**
BOSSA N=63	$r_t = -17.575 - 0.107\, r_{t-1} - 0.149\, r_{t-2} + 1.085\, h_t$ (-0.36) (-0.57) (-1.28) (0.46)	$h_t = 562.794 - 0.481\, h_{t-1} + 0.180 e_{t-1}$ (1.62) (-0.77) (0.62)
CARSI N=55	$r_t = -353.604 + 0.121\, r_{t-1} - 0.053\, r_{t-2} + 14.434\, h_t$ (-0.43) (0.74) (-0.46) (0.44)	$h_t = 515.785 + 0.174\, h_{t-1} + 0.012 e_{t-1}$ (0.31) (0.06) (0.43)
CLEBI N=48	$r_t = 3.919 + 0.355\, r_{t-1} + 0.059\, r_{t-2} + 0.039\, h_t$ (0.08) (1.48) (0.30) (0.01)	$h_t = 222.882 + 0.414\, h_{t-1} + 0.165 e_{t-1}$ (0.50) (0.40) (0.59)
CIMSA N=178	$r_t = 33.13 + 0.144\, r_{t-1} + 0.004\, r_{t-2} - 1.092\, h_t$ (1.64)* (1.43) (0.04) (-1.22)	$h_t = 47.523 + 0.86\, h_{t-1} + 0.05 e_{t-1}$ (0.78) (5.70)*** (0.91)
DEVA N=178	$r_t = -20.228 + 0.163\, r_{t-1} - 0.091\, r_{t-2} + 0.456\, h_t$ (-0.07) (1.30) (-0.44) (0.13)	$h_t = 2423.04 + 0.602\, h_{t-1} + 0.021 e_{t-1}$ (0.56) (0.82) (-0.6)
DISBA N=96	$r_t = -27.979 + 0.07\, r_{t-1} + 0.061\, r_{t-2} + 1.768\, h_t$ (-1.65)* (1.06) (1.18) (2.12)**	$h_t = 120.623 + 0.885\, h_{t-1} - 0.114 e_{t-1}$ (6.00)*** (22.94)*** (-4.38)***
DOHOL N=91	$r_t = -49.451 + 0.356\, r_{t-1} + 0.014\, r_{t-2} + 2.027\, h_t$ (-2.03)** (4.61)*** (0.16) (2.71)***	$h_t = 73.142 + 1.019\, h_{t-1} - 0.088 e_{t-1}$ (6.47)*** (23.27)*** (-3.52)***
ECILC N=127	$r_t = 7.790 - 0.039\, r_{t-1} - 0.051\, r_{t-2} - 0.093\, h_t$ (0.35) (-0.35) (-0.61) (-0.11)	$h_t = 1151.58 - 0.735\, h_{t-1} + 0.083 e_{t-1}$ (3.28)*** (-2.01)** (1.35)
ECYAP N=67	$r_t = 80.694 + 0.233\, r_{t-1} + 0.076\, r_{t-2} - 3.494\, h_t$ (1.19) (1.22) (0.45) (-1.09)	$h_t = 505.807 - 0.237\, h_{t-1} + 0.235 e_{t-1}$ (2.01)** (-0.61) (0.94)
ECZYT N=180	$r_t = -9.338 + 0.203\, r_{t-1} - 0.106\, r_{t-2} + 0.629\, h_t$ (-0.23) (1.79)* (-1.34) (0.51)	$h_t = 642.896 + 0.456\, h_{t-1} - 0.046 e_{t-1}$ (1.21) (0.94) (-4.73)***
EREGL N=180	$r_t = -10.555 - 0.04\, r_{t-1} + 0.004\, r_{t-2} + 0.716\, h_t$ (-0.68) (-0.37) (0.05) (1.19)	$h_t = 139.391 + 0.653\, h_{t-1} + 0.17 e_{t-1}$ (1.99)** (4.61)*** (1.9)*
FINBN N=131	$r_t = -61.73 + 0.177\, r_{t-1} - 0.049\, r_{t-2} + 2.694\, h_t$ (-0.33) (1.55) (-0.53) (0.36)	$h_t = 240.855 + 0.657\, h_{t-1} - 0.024 e_{t-1}$ (0.75) (1.4) (-0.47)
FROTO N=178	$r_t = -6.807 + 0.063\, r_{t-1} - 0.004\, r_{t-2} + 0.018\, h_t$ (-0.10) (0.43) (-0.10) (0.27)	$h_t = 589.591 + 0.387\, h_{t-1} - 0.02 e_{t-1}$ (0.49) (0.31) (-0.36)

Appendix 1: Estimated GARCH-M(1,1) Models

GARAN N=127	$r_t = -6.286 + 0.154\, r_{t-1} - 0.023\, r_{t-2} + 0.606\, h_t$ (-0.25) (1.5) (-0.27) (0.57)	$h_t = 378.989 + 0.407\, h_{t-1} - 0.079 e_{t-1}$ (0.95) (0.61) (-0.72)
GEDIZ N=59	$r_t = -3.116 + 0.224\, r_{t-1} - 0.016\, r_{t-2} + 0.097\, h_t$ (-0.30) (1.18) (-0.17) (0.24)	$h_t = 596.412 - 0.514\, h_{t-1} + 0.463 e_{t-1}$ (3.16)*** (-2.31)** (1.14)
GIMA N=115	$r_t = -18.201 - 0.021\, r_{t-1} - 0.1\, r_{t-2} + 0.915\, h_t$ (-0.37) (-0.15) (-0.61) (0.59)	$h_t = 201.407 + 0.737\, h_{t-1} + 0.073 e_{t-1}$ (0.88) (2.66)*** (0.9)
GLMDE N=66	$r_t = -16.333 + 0.05\, r_{t-1} + 0.147\, r_{t-2} + 0.702\, h_t$ (-0.11) (0.22) (0.73) (0.16)	$h_t = 568.098 + 0.420\, h_{t-1} + 0.062 e_{t-1}$ (0.27) (0.20) (0.22)
GUSGR N=72	$r_t = 3.988 + 0.203\, r_{t-1} - 0.091 r_{t-2} + 0.184 h_t$ (0.02) (0.7) (-0.33) (0.02)	$h_t = 371.41 + 0.429\, h_{t-1} - 0.037 e_{t-1}$ (0.36) (0.27) (-0.25)
HEKTS N=180	$r_t = -7.532 + 0.043\, r_{t-1} - 0.046\, r_{t-2} + 0.015\, h_t$ (-0.12) (0.35) (-0.34) (0.26)	$h_t = 527.812 + 0.483\, h_{t-1} - 0.026 e_{t-1}$ (0.68) (0.62) (-2.81)
HURGZ N=105	$r_t = -53.558 + 0.116 r_{t-1} + 0.07 r_{t-2} + 1.271 h_t$ (-0.61) (0.4) (0.56) (0.82)	$h_t = 1206.672 + 0.583\, h_{t-1} - 0.046\, e_{t-1}$ (1.36) (1.88)** (-3.09)***
ISCTR N=156	$r_t = 82.337 + 0.141 r_{t-1} + 0.238 r_{t-2} - 2.508 h_t$ (1.96)** (2.35)** (2.75)*** (-1.63)	$h_t = 154.225 + 0.754 h_{t-1} + 0.072 e_{t-1}$ (1.10) (3.91)*** (1.26)
IZMDC N=178	$r_t = -53.915 + 0.16 r_{t-1} - 0.052 r_{t-2} + 1.424 h_t$ (-0.5) (1.02) (-0.44) (0.58)	$h_t = 644.704 + 0.675 h_{t-1} - 0.061 e_{t-1}$ (1.39) (2.95)*** (-1.28)
IHLAS N=80	$r_t = -33.485 + 0.278\, r_{t-1} - 0.05 r_{t-2} + 1.99 h_t$ (-0.97) (2.35)** (-0.45) (1.32)	$h_t = -27.05 + 1.075 h_{t-1} - 0.024 e_{t-1}$ (-1.72)* (18.8)*** (-1.56)
KCHOL N=180	$r_t = -17.019 + 0.011\, r_{t-1} + 0.041\, r_{t-2} + 0.033\, h_t$ (-0.52) (0.09) (0.38) (0.81)	$h_t = 488.167 + 0.417\, h_{t-1} - 0.037 e_{t-1}$ (0.85) (0.6) (-1.27)
KENT N=120	$r_t = 4.381 - 0.365 r_{t-1} + 0.01 r_{t-2} + 0.087 h_t$ (0.51) (-2.36)* (0.04) (0.32)	$h_t = 578.523 - 0.054 h_{t-1} + 1.209 e_{t-1}$ (3.3)*** (-0.47) (1.91)*
KORDS N=178	$r_t = 7.9 + 0.188 r_{t-1} + 0.006 r_{t-2} - 0.012 h_t$ (0.43) (1.69)* (0.06) (-0.01)	$h_t = 91.65 + 0.72 h_{t-1} + 0.119 e_{t-1}$ (1.08) (3.49)*** (1.59)
MIGRS N=117	$r_t = 5.069 + 0.061 r_{t-1} - 0.173 r_{t-2} + 0.279 h_t$ (0.21) (0.54) (-1.6) (0.2)	$h_t = 206.05 + 0.432 h_{t-1} - 0.077 e_{t-1}$ (0.9) (0.63) (-1.14)
MILYT N=86	$r_t = 8.705 + 0.162\, r_{t-1} + 0.016\, r_{t-2} - 0.038 h_t$ (0.18) (0.9) (0.13) (-0.02)	$h_t = 206.05 + 0.432 h_{t-1} - 0.077 e_{t-1}$ (0.9) (0.63) (-1.14)

Appendix 1: Estimated GARCH-M(1,1) Models	
MIPAZ N=83	$r_t = 19.046 + 0.195\, r_{t-1} - 0.077\, r_{t-2} - 0.008\, h_t$ $h_t = 607.526 + 0.476\, h_{t-1} - 0.071 e_{t-1}$ (0.65) (0.8) (-0.43) (-0.31) (0.32) (0.28) (-0.32)
MRDIN N=160	$r_t = -2.748 - 0.021\, r_{t-1} - 0.173\, r_{t-2} + 0.437 h_t$ $h_t = 59.252 + 0.865 h_{t-1} + 0.047 e_{t-1}$ (-0.13) (-0.17) (-1.03) (0.52) (1.57) (10.92)*** (1.23)
NETAS N=94	$r_t = 12.108 - 0.021\, r_{t-1} + 0.033\, r_{t-2} - 0.264\, h_t$ $h_t = 406.813 - 0.041\, h_{t-1} + 0.464 e_{t-1}$ (0.87) (-0.14) (0.33) (-0.42) 4.92)*** (-1.00) (2.70)***
NTHOL N=133	$r_t = -3.955 + 0.064\, r_{t-1} - 0.175\, r_{t-2} + 0.239 h_t$ $h_t = 696.671 - 0.146 h_{t-1} + 0.5 e_{t-1}$ (-0.45) (0.5) (-2.47)** (0.75) (3.73)*** (-1.09) (3.9)***
NTTUR N=120	$r_t = -27.442 + 0.081\, r_{t-1} + 0.056\, r_{t-2} + 1.237 h_t$ $h_t = 713.126 - 0.012 h_{t-1} + 0.192 e_{t-1}$ (-0.54) (0.57) (0.55) (0.7) (2.47)** (-0.03) (0.84)
OTKAR N=67	$r_t = 54.664 - 0.001\, r_{t-1} - 0.091 r_{t-2} - 1.63\, h_t$ $h_t = 471.6 + 0.449 h_{t-1} - 0.103 e_{t-1}$ (0.64) (-0.00) (-0.54) (-0.52) (0.93) (0.62) (-1.31)
PETKM N=124	$r_t = 36.702 - 0.073\, r_{t-1} + 0.1 r_{t-2} - 0.85\, h_t$ $h_t = 796.11 + 0.267 h_{t-1} - 0.04 e_{t-1}$ (0.73) (-0.61) (1.5) (-0.54) (1.43) (0.49) (-2.12)**
PTOFS N=114	$r_t = -5.011 + 0.007\, r_{t-1} + 0.054 r_{t-2} + 0.57\, h_t$ $h_t = 615.298 + 0.301 h_{t-1} - 0.135 e_{t-1}$ (-0.32) (0.07) (0.62) (0.99) (2.1)** (0.83) (-5.04)***
SASA N=48	$r_t = -108.46 + 0.228\, r_{t-1} - 0.083 r_{t-2} + 6.22\, h_t$ $h_t = 64.987 + 0.743 h_{t-1} + 0.092 e_{t-1}$ (-0.74) (1.51) (-0.48) (0.83) (1.65)* (8.00)*** (0.91)
SISE N=178	$r_t = 39.455 + 0.075\, r_{t-1} + 0.112 r_{t-2} - 0.982\, h_t$ $h_t = 258.868 + 0.666 h_{t-1} + 0.066 e_{t-1}$ (1.05) (0.61) (1.01) (-0.79) (0.83) (1.8)* (0.87)
TATKS N=87	$r_t = -1.113 + 0.160\, r_{t-1} - 0.243 r_{t-2} + 0.265\, h_t$ $h_t = 251.518 + 0.069 h_{t-1} + 0.589 e_{t-1}$ (-0.13) (1.26) (-3.88)*** (0.6) (3.89)*** (-0.65) (2.98)***
TNSAS N=50	$r_t = -26.319 + 0.287\, r_{t-1} + 0.029 r_{t-2} + 1.643\, h_t$ $h_t = 320.528 + 0.605 h_{t-1} - 0.246 e_{t-1}$ (-0.83) (1.9)* (0.16) (1.28) (1.13) (1.26) (-2.77)***
TOASO N=112	$r_t = -36.625 - 0.233\, r_{t-1} + 0.134 r_{t-2} + 1.639\, h_t$ $h_t = 644.12 - 0.147 h_{t-1} + 0.357 e_{t-1}$ (-1.79)* (-1.6) (1.7)* (2.29)** (4.35)*** (-0.91) (2.37)**
TRKCM N=120	$r_t = -78.304 + 0.079\, r_{t-1} + 0.000 r_{t-2} + 3.868\, h_t$ $h_t = 530.221 - 0.119 h_{t-1} + 0.042 e_{t-1}$ (-0.32)* (0.71) (0.005) (0.35) (1.45) (-0.16) (0.39)**
TSKB N=140	$r_t = 2.796 + 0.202\, r_{t-1} - 0.023 r_{t-2} + 0.190\, h_t$ $h_t = 413.253 + 0.411\, h_{t-1} - 0.02 e_{t-1}$ (0.01) (1.2) (-0.16) (0.03) (0.20) (0.137) (-0.48)

Appendix 1: Estimated GARCH-M(1,1) Models

TUDDF	$r_t = -133.285 - 0.272\, r_{t-1} + 0.177 r_{t-2} + 3.187\, h_t$	$h_t = 494.44 + 0.769\, h_{t-1} + 0.356 e_{t-1}$
N=178	(-2.05)** (-0.44) (0.51) (17.83)***	(0.57) (2.78)*** (9.51)***
TUPRS	$r_t = 6.927 - 0.07\, r_{t-1} + 0.062\, r_{t-2} + 0.210\, h_t$	$h_t = 710.769 + 0.445\, h_{t-1} - 0.049 e_{t-1}$
N=94	(0.05) (-0.47) (0.44) (0.05)	(0.55) (0.42) (-1.74)*
UCAK	$r_t = -40.605 + 0.09\, r_{t-1} - 0.119\, r_{t-2} + 2.298\, h_t$	$h_t = 287.757 + 0.144\, h_{t-1} + 0.245 e_{t-1}$
N=85	(-1.38) (0.89) (-0.97) (1.60)	(2.21)** (0.56) (1.49)
VESTL	$r_t = 27.307 + 0.135\, r_{t-1} + 0.027\, r_{t-2} - 0.806\, h_t$	$h_t = 719.723 - 0.206\, h_{t-1} + 0.180 e_{t-1}$
N=125	(0.93) (1.11) (0.29) (-0.69)	(2.32)** (-0.51) (1.49)
YKBNK	$r_t = -42.551 - 0.95\, r_{t-1} - 0.723\, r_{t-2} + 1.119\, h_t$	$h_t = -79.993 + 0.273\, h_{t-1} + 1.413 e_{t-1}$
N=162	(-12.93)***(-5.90)***(-2.28)*** (11.51)***	(-0.65) (6.52)*** (5.73)***

Appendix 2: Estimated Autoregressions	
ISE-100	$R_t = 0.011 + 0.016 R_{t-1} + 0.07 R_{t-2} - 0.049 R_{t-3} + 0.011 R_{t-4} + 0.017 R_{t-5}$ (2.90)*** (0.37) (1.58) (-1.11) (0.26) (0.40)
ADANA N=115	$R_t = 7.230 + 0.103 R_{t-1} - 0.121 R_{t-2} - 0.006 R_{t-3} - 0.131 R_{t-4}$ (4.06)***(1.09) (-1.27) (0.06) (-1.40)
AKBANK N=119	$R_t = 6.739 - 0.094 R_{t-1} + 0.063 R_{t-2} + 0.095 R_{t-3} + 0.078 R_{t-4}$ (3.00)***(-0.99) (0.67) (1.00) (0.82)
AKCNS N=47	$R_t = 4.738 + 0.141 R_{t-1} - 0.051 R_{t-2} - 0.119 R_{t-3} + 0.122 R_{t-4}$ (1.56) (1.09) (-1.27) (0.06) (-1.40)
AKGRT N=69	$R_t = 9.538 + 0.023 R_{t-1} + 0.023 R_{t-2} - 0.082 R_{t-3} - 0.045 R_{t-4}$ (3.16)***(0.19) (0.18) (-0.65) (-0.36)
AKSA N=126	$R_t = 6.356 - 0.020 R_{t-1} - 0.126 R_{t-2} - 0.061 R_{t-3} - 0.099 R_{t-4}$ (4.06)***(-0.22) (-1.39) (-0.79) (1.27)
ALARK N=136	$R_t = 8.766 - 0.013 R_{t-1} - 0.056 R_{t-2} + 0.087 R_{t-3} + 0.034 R_{t-4}$ (2.65)*** (-0.15) (-0.64) (0.99) (0.38)
ALCTL N=147	$R_t = 9.266 + 0.108 R_{t-1} - 0.060 R_{t-2} + 0.030 R_{t-3} - 0.031 R_{t-4}$ (3.86)*** (1.28) (-0.72) (0.36) (-0.37)
ALGYO N=41	$R_t = 7.291 + 0.306 R_{t-1} - 0.287 R_{t-2} + 0.092 R_{t-3} - 0.012 R_{t-4}$ (2.75)*** (1.84)* (-1.60) (0.49) (-0.07)
ALNTF N=62	$R_t = 9.315 + 0.422 R_{t-1} - 0.294 R_{t-2} - 0.055 R_{t-3} + 0.108 R_{t-4}$ (1.78)* (3.21)** (-2.03)** (-0.38) (0.82)
ANACM N=173	$R_t = 8.472 + 0.087 R_{t-1} + 0.072 R_{t-2} + 0.063 R_{t-3} - 0.085 R_{t-4}$ (3.66)*** (1.12) (0.93) (0.82) (-1.10)
ANSGR N=83	$R_t = 7.477 + 0.234 R_{t-1} - 0.069 R_{t-2} - 0.115 R_{t-3} - 0.111 R_{t-4}$ (2.81)***(2.08)** (-0.59) (-1.01) (-0.99)
ARCLK N=176	$R_t = 8.761 + 0.003 R_{t-1} - 0.085 R_{t-2} - 0.025 R_{t-3} + 0.090 R_{t-4}$ (4.06)***(1.09) (-1.27) (0.06) (-1.40)
ASELS N=118	$R_t = 9.162 - 0.030 R_{t-1} - 0.123 R_{t-2} + 0.022 R_{t-3} - 0.110 R_{t-4}$ (4.79)*** (-0.31) (-1.32) (0.24) (-1.19)

Appendix 2: Estimated Autoregressions	
ATEKS N=52	$R_t = 4.097 + 0.134\,R_{t-1} + 0.169\,R_{t-2} + 0.125\,R_{t-3} - 0.321\,R_{t-4}$ (1.10) (0.98) (1.22) (0.90) (-2.18)**
AYGAZ N=127	$R_t = 9.217 + 0.030\,R_{t-1} - 0.150\,R_{t-2} - 0.031\,R_{t-3} - 0.079\,R_{t-4}$ (5.06)*** (0.33) (-1.71)* (-0.35) (-0.90)
BAGFA N=173	$R_t = 11.448 + 0.007\,R_{t-1} - 0.121\,R_{t-2} - 0.039\,R_{t-3} - 0.159\,R_{t-4}$ (4.98)*** (0.07) (-1.15) (-0.37) (-1.50)
BANVT N=94	$R_t = 11.448 + 0.007\,R_{t-1} - 0.051\,R_{t-2} - 0.119\,R_{t-3} + 0.122\,R_{t-4}$ (4.06)*** (1.09) (-1.27) (0.06) (-1.40)
BEKO N=95	$R_t = 6.426 + 0.151\,R_{t-1} - 0.102\,R_{t-2} + 0.174\,R_{t-3} - 0.134\,R_{t-4}$ (2.59)** (1.44) (-0.95) (1.60) (-1.21)
BOLUC N=173	$R_t = 8.193 + 0.018\,R_{t-1} - 0.004\,R_{t-2} + 0.077\,R_{t-3} - 0.058\,R_{t-4}$ (3.86)***(0.24) (-0.05) (1.01) (-0.77)
BRYAT N=43	$R_t = 7.837 + 0.3858\,R_{t-1} + 0.102\,R_{t-2} + 0.135\,R_{t-3} - 0.305\,R_{t-4}$ (1.42) (2.60)** (0.67) (0.88) (-2.10)**
BOSSA N=58	$R_t = 6.062 + 0.045\,R_{t-1} - 0.034\,R_{t-2} + 0.198\,R_{t-3} - 0.013\,R_{t-4}$ (2.44)** (0.34) (-0,26) (1.52) (-0.10)
CARSI N=51	$R_t = 8.364 + 0.200\,R_{t-1} - 1.930\,R_{t-2} + 0.054\,R_{t-3} - 0.027\,R_{t-4}$ (1.67) (1.38) (-0.00) (0.37) (-0.18)
CIMSA N=176	$R_t = 8.255 + 0.100\,R_{t-1} + 0.052\,R_{t-2} - 0.052\,R_{t-3} + 0.092\,R_{t-4}$ (3.74)***(1.32) (0.68) (-0.68) (1.22)
CLEBI N=46	$R_t = 6.494 + 0.272\,R_{t-1} + 0.227\,R_{t-2} - 0.033\,R_{t-3} - 0.234\,R_{t-4}$ (1.31) (1.59) (1.24) (-0.19) (-1.58)
DEVA N=174	$R_t = 12.389 + 0.090\,R_{t-1} - 0.066\,R_{t-2} - 0.071\,R_{t-3} - 0.011\,R_{t-4}$ (2.80)*** (1.17) (-0.86) (-0.92) (-0.14)
DISBA N=92	$R_t = 7.865 + 0.187\,R_{t-1} - 0.123\,R_{t-2} + 0.009\,R_{t-3} - 0.091\,R_{t-4}$ (3.10)***(1.84)* (-1.18) (0.09) (-0.90)
DOHOL N=87	$R_t = 10.096 + 0.233\,R_{t-1} - 0.101\,R_{t-2} + 0.090\,R_{t-3} - 0.176\,R_{t-4}$ (2.80)*** (2.16)** (-0.93) (0.82) (-1.68)

Appendix 2: Estimated Autoregressions

ECILC N=123	$R_t = 6.655 - 0.010\,R_{t-1} - 0.084\,R_{t-2} - 0.017\,R_{t-3} - 0.140\,R_{t-4}$ (3.47)***(-0.11) (-0.92) (-0.20) (-1.65)*
ECYAP N=63	$R_t = 5.350 - 0.015\,R_{t-1} + 0.040\,R_{t-2} + 0.125\,R_{t-3} - 0.287\,R_{t-4}$ (2.12)** (-0.12) (0.31) (0.95) (-2.17)**
ECZYT N=176	$R_t = 11.173 + 0.160\,R_{t-1} - 0.103\,R_{t-2} + 0.101\,R_{t-3} - 0.090\,R_{t-4}$ (4.15)*** (2.10)** (-1.34) (1.30) (-1.17)
ENKA N=174	$R_t = 11.812 + 0.008\,R_{t-1} - 0.141\,R_{t-2} - 0.006\,R_{t-3} - 0.036\,R_{t-4}$ (4.87)*** (0.11) (-1.84)* (-0.08) (-0.46)
EREGL N=176	$R_t = 8.846 - 0.031\,R_{t-1} - 0.104\,R_{t-2} + 0.063\,R_{t-3} - 0.071\,R_{t-4}$ (3.39)***(-0.41) (1.36) (0.82) (0.92)
FINBN N=127	$R_t = 7.746 + 0.150\,R_{t-1} - 0.091\,R_{t-2} + 0.027\,R_{t-3} - 0.115\,R_{t-4}$ (3.46)***(1.68)* (-0.99) (0.31) (-1.64)
FROTO N=173	$R_t = 10.586 + 0.120\,R_{t-1} + 0.001\,R_{t-2} - 0.090\,R_{t-3} - 0.007\,R_{t-4}$ (5.04)*** (1.57) (0.02) (-1.16) (0.09)
GARAN N=123	$R_t = 7.939 + 0.080\,R_{t-1} - 0.004\,R_{t-2} - 0.016\,R_{t-3} + 0.130\,R_{t-4}$ (2.91)*** (0.88) (0.05) (-0.17) (1.37)
GEDIZ N=55	$R_t = 5.445 + 0.242\,R_{t-1} + 0.218\,R_{t-2} - 0.075\,R_{t-3} - 0.023\,R_{t-4}$ (1.01) (1.72)* (1.53) (-0.52) (0.26)
GIMA N=111	$R_t = 11.024 - 0.085\,R_{t-1} + 0.007\,R_{t-2} + 0.115\,R_{t-3} - 0.030\,R_{t-4}$ (3.50)***(-0.87) (0.08) (1.18) (-0.31)
GLMDE N=61	$R_t = 8.580 + 0.164\,R_{t-1} + 0.199\,R_{t-2} - 0.146\,R_{t-3} + 0.066\,R_{t-4}$ (1.27) (1.22) (1.48) (-1.07) (0.49)
HEKTS N=173	$R_t = 7.916 + 0.067\,R_{t-1} - 0.068\,R_{t-2} + 0.176\,R_{t-3} - 0.015\,R_{t-4}$ (3.14)*** (0.86) (-0.87) (2.34)** (-0.20)
HURGZ N=100	$R_t = 13.438 - 0.014\,R_{t-1} + 0.059\,R_{t-2} - 0.171\,R_{t-3} - 0.059\,R_{t-4}$ (3.41)***(-0.13) (0.57) (-1.69)* (-0.57)
IHLAS N=78	$R_t = 8.225 + 0.302\,R_{t-1} - 0.008\,R_{t-2} - 0.073\,R_{t-3} - 0.115\,R_{t-4}$ (2.40)** (2.64)** (-0.07) (-0.60) (-0.99)

Appendix 2: Estimated Autoregressions	
ISCTR N=154	$R_t = 10.019 + 0.033\ R_{t-1} + 0.289\ R_{t-2} - 0.054\ R_{t-3} - 0.126\ R_{t-4}$ (3.57)*** (0.41) (3.58)*** (-0.67) (-1.63)
GUSGR N=67	$R_t = 7.639 + 0.217\ R_{t-1} + 0.013\ R_{t-2} - 0.116\ R_{t-3} - 0.097\ R_{t-4}$ (2.71)***(1.69)* (0.10) (-0.88) (-0.74)
IZMDC N=173	$R_t = 7.302 + 0.053\ R_{t-1} - 0.083\ R_{t-2} + 0.022\ R_{t-3} - 0.030\ R_{t-4}$ (3.42)***(0.069) (-1.08) (0.28) (-0.39)
KENT N=115	$R_t = 7.796 - 0.033\ R_{t-1} - 0.061\ R_{t-2} - 0.133\ R_{t-3} - 0.068\ R_{t-4}$ (3.809)*** (-0.34) (-0.64) (-1.40) (-0.71)
KCHOL N=173	$R_t = 9.777 + 0.087\ R_{t-1} + 0.061\ R_{t-2} - 0.021\ R_{t-3} - 0.081\ R_{t-4}$ (4.16)***(1.12) (0.78) (-0.28) (-1.04)
KORDS N=173	$R_t = 8.147 + 0.110\ R_{t-1} + 0.042\ R_{t-2} - 0.014\ R_{t-3} + 0.060\ R_{t-4}$ (4.11)***(1.42) (0.56) (-0.18) (-0.77)
MRDIN N=155	$R_t = 8.535 - 0.034\ R_{t-1} - 0.181\ R_{t-2} + 0.088\ R_{t-3} - 0.106\ R_{t-4}$ (5.14)*** (-0.41) (-2.22)** (1.07) (-1.30)
MIGRS N=112	$R_t = 9.961 + 0.022\ R_{t-1} - 0.165\ R_{t-2} - 0.033\ R_{t-3} - 0.092\ R_{t-4}$ (7.41)***(0.22) (-1.73)* (-0.33) (-0.96)
MILYT N=81	$R_t = 8.112 + 0.179\ R_{t-1} + 0.051 R_{t-2} - 0.074\ R_{t-3} - 0.044\ R_{t-4}$ (1.72)* (1.55) (0.43) (-0.63) (-0.37)
MIPAZ N=76	$R_t = 10.512 + 0.189\ R_{t-1} - 0.200 R_{t-2} - 0.135\ R_{t-3} - 0.040\ R_{t-4}$ (4.59)*** (1.63) (-1.70)* (-1.13) (-0.34)
NTHOL N=128	$R_t = 7.760 + 0.291\ R_{t-1} - 0.180 R_{t-2} + 0.189\ R_{t-3} - 0.097\ R_{t-4}$ (2.55)** (3.22)*** (-1.91)* (2.02)** (-1.04)
NTTUR N=115	$R_t = 8.462 + 0.137\ R_{t-1} - 0.093 R_{t-2} - 0.047\ R_{t-3} + 0.022\ R_{t-4}$ (2.77)***(1.43) (0.96) (-0.49) (0.23)
NETAS N=87	$R_t = 8.892 + 0.087\ R_{t-1} + 0.015 R_{t-2} + 0.050\ R_{t-3} + 0.008\ R_{t-4}$ (2.51)** (0.78) (0.13) (0.45) (0.89)
OTKAR N=62	$R_t = 9.620 + 0.087\ R_{t-1} + 0.004\ R_{t-2} + 7.680\ R_{t-3} - 0.052\ R_{t-4}$ (3.48)*** (0.68) (0.03) (0.00) (-0.42)

Appendix 2: Estimated Autoregressions	
PETKM N=119	$R_t = 10.011 - 0.001\, R_{t-1} + 0.126\, R_{t-2} + 0.080\, R_{t-3} - 0.052\, R_{t-4}$ (3.24)***(-0.05) (1.36) (0.86) (-0.56)
PTOFS N=109	$R_t = 10.087 - 0.132\, R_{t-1} + 0.114\, R_{t-2} + 0.082\, R_{t-3} - 0.072\, R_{t-4}$ (4.08)***(-1.34) (1.15) (0.83) (-0.73)
SASA N=43	$R_t = 7.087 + 0.298\, R_{t-1} - 0.004\, R_{t-2} - 0.142\, R_{t-3} + 0.158\, R_{t-4}$ (1.43) (1.73)* (-0.02) (-0.84) (0.92)
SISE N=173	$R_t = 9.939 + 0.004\, R_{t-1} + 0.068\, R_{t-2} - 0.060\, R_{t-3} + 0.103\, R_{t-4}$ (3.74)*** (0.06) (0.89) (0.78) (1.36)
TUDDF N=173	$R_t = 8.679 - 0.052\, R_{t-1} - 0.061\, R_{t-2} - 0.030\, R_{t-3} + 0.072\, R_{t-4}$ (4.29)***(0.68) (-0.80) (-0.39) (0.93)
TSKB N=135	$R_t = 7.333 + 0.202\, R_{t-1} - 0.036\, R_{t-2} - 0.010\, R_{t-3} + 0.010\, R_{t-4}$ (2.68)***(2.30)** (-0.40) (0.11) (0.11)
TNSAS N=45	$R_t = 12.133 + 0.242\, R_{t-1} + 0.006\, R_{t-2} + 0.021\, R_{t-3} - 0.132\, R_{t-4}$ (5.06)*** (1.75)* (0.05) (0.15) (-0.95)
TATKS N=82	$R_t = 6.777 + 0.238\, R_{t-1} - 0.250\, R_{t-2} + 0.125\, R_{t-3} - 0.025\, R_{t-4}$ (2.60)** (2.08)** (-2.10)** (1.04) (-0.22)
TOASO N=107	$R_t = 7.820 + 0.045\, R_{t-1} + 0.175\, R_{t-2} - 0.093\, R_{t-3} + 0.006\, R_{t-4}$ (2.72)*** (0.48) (1.86)* (-0.97) (0.07)
TRKCM N=115	$R_t = 7.855 + 0.152\, R_{t-1} - 0.038\, R_{t-2} + 0.134\, R_{t-3} - 0.134\, R_{t-4}$ (3.41)***(1.60) (-0,39) (0.15) (-0.95)
TUPRS N=89	$R_t = 12.083 - 0.144\, R_{t-1} - 0.058\, R_{t-2} + 0.126\, R_{t-3} - 0.064\, R_{t-4}$ (4.29)***(-1.35) (0.55) (1.18) (-0.59)
THYAO N=114	$R_t = 10.277 - 0.050\, R_{t-1} - 0.079\, R_{t-2} + 0.043\, R_{t-3} - 0.016\, R_{t-4}$ (3.61)***(-0.51) (-0.82) (0.44) (-0.17)
UCAK N=80	$R_t = 8.500 + 0.176\, R_{t-1} - 0.200\, R_{t-2} + 0.235\, R_{t-3} - 0.080\, R_{t-4}$ (3.09)*** (1.56) (-1.73)* (2.02)** (-0.76)
VESTL N=120	$R_t = 8.064 + 0.074\, R_{t-1} + 0.009\, R_{t-2} + 0.034\, R_{t-3} - 0.126\, R_{t-4}$ (3.38)***(0.80) (0.09) (0.37) (-1.37)

Appendix 2: Estimated Autoregressions	
YASAS N=157	$R_t = 8.176 + 0.143\ R_{t-1} + 0.027\ R_{t-2} + 0.057\ R_{t-3} - 0.059\ R_{t-4}$ (3.22)***(1.77)* (0.33) (0.70) (-0.92)
YKBNK N=157	$R_t = 10.564 + 0.023\ R_{t-1} + 0.004\ R_{t-2} - 0.024\ R_{t-3} + 0.059\ R_{t-4}$ (3.38)*** (0.29) (0.04) (-0.30) (0.74)